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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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Charles H. Dennison

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EXAMINER

LOKE, STEVEN HO YIN

ART UNIT

PAPER NUMBER

2811

DATE MAILED: 06/13/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/633,886	DENNISON, CHARLES H.	
	Examiner	Art Unit	
	Steven Loke	2811	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 31 March 2006.
- 2a) ☒ This action is FINAL. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,3-21,23,24 and 26-29 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 20,21,23,24 and 26-29 is/are rejected.
- 7) ☒ Claim(s) 1 and 3-19 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

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1. Claims 1 and 3-20 are objected to because of the following informalities: Claim 1, line 4, the phrase "the storage element" is unclear whether it is being referred to "the phase change storage element"; line 4, the phrase "the threshold switch" is unclear whether it is being referred to "the phase change threshold switch". Appropriate correction is required.

2. Claim 20 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 20, lines 1-3, the phrase "forming said groove in said periphery to a depth below the upper extent of said upper electrode and above the lower extent of said upper electrode" is vague and indefinite. Since claim 15 discloses the groove ([48] in fig. 12) in the periphery is formed all the way to the bottom of the phase change memory, the groove in said periphery has a depth below the upper extent of said upper electrode and below the lower extent of said upper electrode. The claim should rewrite as "forming said groove in said periphery to a depth below the upper extent of said upper electrode and below the lower extent of said upper electrode".

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

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4. Claims 21 and 27 are rejected under 35 U.S.C. 102(b) as being clearly anticipated by Technische Hochschule Karl-Marx-Stadt (DD 251 225 A1 in the IDS filed on 1/21/05).

In regards to claim 21, Technische Hochschule Karl-Marx-Stadt shows all the elements of claimed invention in figs. 1 and 2. It is an apparatus, comprising: a phase change memory [9, 10] including a phase change storage element [9, (5, 7, 8)] and a phase change threshold switch [10, (2, 4, 5)]; a conductive line [2] coupled to said phase change storage element [9] and said phase change threshold switch [10]; and a via (an area where layer [4] extends through the silicon dioxide layer [3]) to said conductive line [2].

In regards to claim 27, Technische Hochschule Karl-Marx-Stadt further discloses a barrier layer [6] between the threshold switch [10, (a portion of layer [5] under layer [6], 2, 4)] and the storage element [9, (a portion of layer [5] not under layer [6], 7, 8)].

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

6. Claims 21, 23, 24, 26, 27 and 29 are rejected under 35 U.S.C. 102(e) as being clearly anticipated by Parkinson et al.

In regards to claim 21, Parkinson et al. show all the elements of the claimed invention in figs. 4-12. It is an apparatus, comprising: a phase change memory [500] (the device in the right side of fig. 12) including a phase change storage element [130] and a phase change threshold switch [120]; a conductive line [270] coupled to said phase change storage element [130] and said phase change threshold switch [120]; and a via ([340] formed under the memory [100] in the middle of fig. 12) to said conductive line.

In regards to claim 23, Parkinson et al. show said switch [120] is formed over said element [130].

In regards to claim 24, Parkinson et al. show said memory includes a substrate [240], a pore (the area occupied by [340]) over a substrate [240], said pore having a dimension smaller than the feature size possible with lithographic techniques (col. 13, lines 11-15).

In regards to claim 26, Parkinson et al. show an electrode [340] for said phase change storage element [130] in said pore.

In regards to claim 27, Parkinson et al. show a barrier layer [370] between said threshold switch [120] and said storage element [130].

In regards to claim 29, Parkinson et al. show said memory includes an insulator [280] and said via ([340] formed under the memory [500] in the middle of fig. 12) includes a metal (TaN) line extending through said insulator [280].

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

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(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. Claim 28 is rejected under 35 U.S.C. 103(a) as being unpatentable over

Parkinson et al.

In regards to claim 28, Parkinson et al. show an upper electrode [380] over said phase change storage element [130].

Parkinson et al. differ from the claimed invention by not showing said upper electrode having a vertical extent at least twice its horizontal extent.

It would have been obvious for the upper electrode having a vertical extent at least twice its horizontal extent because it depends on the density of the memory cells in the memory.

9. Applicant's arguments filed 3/31/06 have been fully considered but they are not persuasive.

It is urged, in page 6 of the remarks, that item 55 in fig. 14 meets the claimed limitation in claim 20. However, claims 15-19 disclose the groove [48] in fig. 12. Therefore, it is believed that the groove in claim 20 is the groove [48] in fig. 12. The groove in claim 20 is formed below the lower extent of the upper electrode.

It is urged, in page 6 of the remarks, that the material 4 is actually the phase change material and it would not constitute a via under any reasonably accepted definition adopted by one skilled in the art. However, it is well known in the art that any conductive material can be formed in a hole etched in the interlayer dielectric to vertically connect the stacked up interconnect conductive lines. Since the material [4] is

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a conductive material formed in a hole etched in the interlayer dielectric [6] to vertically connect the stacked up interconnect conductive lines [7, 5], it is considered as a via.

Therefore, claim 21 is still rejected under 35 USC 102 (b) by the Prior Art.

It is urged, in page 6 of the remarks, that the layer 16 is not between the threshold switch and the phase change memory. It is also urged that the layer 16 is an insulating layer which is part of the memory element 9 and there is no barrier layer between the memory element 9 and the decoupling element 10. However, there is no layer 16 in the figures. The layer [6] is formed between the threshold switch [10] and the phase change memory [9] in fig. 1. The layer [6] is an insulating layer (SiO_2) which is part of the memory element [9] and there is a barrier layer [6] between the memory element [9] and the decoupling element [10].

10. Claim 1 would be allowable if rewritten or amended to overcome the objection set forth in this Office action.

11. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

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the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Steven Loke whose telephone number is (571) 272-1657. The examiner can normally be reached on 8:00 am to 5:30 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eddie Lee can be reached on (571) 272-1732. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

sl
June 8, 2006

Steven Loke
Primary Examiner
